invention, and Sheridon et al is a Display invention. The two fields are completely different, and not at all comparable. **Neither solar, nor mirrors, nor specular reflection are in any way part of any Sheridon or gyricon references. They do not discuss or teach any of these subjects. Applicant does agree with Examiner Tra that O'Neill et al does use cooling fins, and fin-related claims have been cancelled.**

II. Specific Responses to Points Raised in Office Action Mailed Sept. 22, 2004

The subject numbers used here correspond to those of Examiner Tra's Action. I quote his relevant statements and give our replies.

1. Specificaton Informality Objection

Applicant thanks Examiner Tra for bringing these two mispellings to my attention. I hereby request that the following changes please be made in the specification:

Page 11, line 19, please change "grourd" to --ground--.

Page 13, line 26, please change "electrosatic" to --electrostatic--.

2. Claim Informality Objection

I thank Examiner Tra for both bringing the poor choice of the words "capablility of" to my attention, and for providing the words "operability of" as a superior replacement in Claim 24. Claim 24 has been amended accordingly.

Claim 15 has been amended to remove the supefluous ":" .

Claim 17 has been amended to remove the supefluous "." .

3. Drawing Reference Character Error

I thank Examiner Tra for bringing the Reference Character Error to my attention. It was an oversight on my part to use reference character 17 as both a label for the "fiducializing sensor" of Fig. 4 and for the "plastic film" of Fig. 8.

Accordingly please make the following changes in the description of Fig. 4 of the specification:

Page 12, last line, please change "17" to –17'–.

Page 13, line 8, please change "17" to –17'–.

Page 13, line 14, please change "17" to –17'–.

A new Sheet 2, containing Figs. 3 and 4 with the corrected reference numeral 17', is being sent to the U.S. Patent Office by separate mail, since this amendment is being sent by FAX.

4. Quotation of 35 U.S.C. 112: Claim Clairity

I am grateful to Examiner Tra for his careful reading of both the specification and claims.

Claim 1 has been accordingly amended.

Claim 24 has been accordingly amended.

5. Quotation of 35 U.S.C. 102 (b): Prior Publication

6. "Claims 1, 4, 5, 7, 9-12, 14, 15, 18, 19 and 21 -23 are rejected under 35 U.S.C. 102 (b) as being anticipated by Sheridon et al. (U.S. Pat. 5,815,306. A)."

Applicant respectfully disagrees. Sheridon et al does not anticipate these claims since **the instant invention reflects light specularly with micro-mirrors embedded in balls for solar energy concentration, and Sheridon et al does neither of these things. The Sheridon et al invention is solely a Display Invention , and the balls are only capable of transmitting light. The Sheridon et al invention does not track the nearby stationary light source, and is certainly not intended for the moving Sun.** In fact their balls are transparent lenses. Col. 6, lines 5 - 6 says that the balls are, " transparent spheres, such as glass, plastic, or epoxy spheres." Col. 6, lines 10 - 11, "the sphere acts like a converging lens." In my invention, the embedded mirrors in each ball of the solar concentator reflect the sun's light, and can track the sun by proper

rotational orientation of the mirrors. The words "concentrator," "mirror," "reflect," and "track," or any variation of them do not occur in Sheridon et al.

What Examiner Tra has refered to as an "optic concentrator (item 22)" is called "substrate 22" Col. 5, line 17; and item 21 is not a reflector, but is a transmitting lens called a "ball" by Sheridon et al. Item 27 is **not** a means for "tracking" , but is a rigid array of somewhat less than hemi-spherical lenses that are fixed in position and cannot track or even rotate. Note that the stationary light source L is an extended light source and rather close to the apparatus, unlike the sun which is far from my solar concentrator and moves relative to the earth. They have no need to track the light source, since for them it is stationary. Further more they require an external focussing lens 28, whereas my solar concentrator accomplishes focussing without the need for any external device, and definitely not a lens since the mirrored balls form a Fresnel reflecting lens themselves. Item 29 in Col. 5 line 32 is called a "**viewing screen 29," and the word "receiver" does not appear anywhere in the patent.** The viewing screen 29 is just for the display of an image from the light source, and is not intended for conversion of solar energy. My specification makes it clear that the "receiver" is a device for the conversion of solar energy into more conveniently usable energy such as electricity. To make this explicitly clear the delimiter "solar energy receiver" has replaced the word "receiver" in the amended claims.

6. b) The word "ground" or its variations such as "earth" do not occur in the Sheridon et al patent. The Sheridon et al rigid unstable vertical structure is not intended to be directly supported by the ground, but needs a separate stablizing mechanical support to keep it from falling over. My solar concentrator is like a sheet that lays stabley on the ground. Their display device is intended for indoor use since its plastic and epoxy materials deteriorate in the sun. My solar concentrator is intended for outdoor use. The ability of my solar concentrator to

lay directly and with stability on uneven ground is an important unique aspect of the instant invention. This novel ability is one of the ways that significantly distinguishes it from other solar concentrators. The ability to be directly supported by the ground or an existing structure is both economically and technically advantageous, as stated in the instant specification, such as on Page 3, paragraph 2:

"This is a great economic advantage over all existing solar concentrators which require the construction of a huge separate structure to support them, and a large guidance system with expensive motors and gears to orient them in order to intercept and properly reflect sunlight. Such separate structures must be able to survive gusts, windstorms, earthquakes, etc. The instant invention utilizes the ground directly or existing structures which are already capable of withstanding such inclement vicissitudes of nature."

6 b) cont'd. The word or concept of "modular" does not occur in Sheridon et al. This is because it is a display device that is relatively small compared to a solar concentrator such as in the instant invention. Other solar concentrators are not adaptable to being modular as they are big and unweidy 3-dimensional parabaloid-like structures, whose separate parts can not act independently. A great advantage of the instant invention is that it can easily be made modular because of its 2-dimensional thin structure, and because each element can act separately i.e. independently.

6. c) The word " wand" or even a similar concept does not occur in the Sheridon et al patent, and focussing alignment is internal. Thus it should not be cited against my invention. My wand aligns the mirrors externally for tracking.

Although the word "film" as in vapor-deposition film applied to the balls does occur in Sheridon et al, it is "a photoresist aperture mask" Col. 10, line 29. This film appears to be non-removable. Its function and application is totally

different than in my removable film to protect the outdoor solar concentrator of the instant invention from contamination such as dirt and grime, and also from ultraviolet degradation. The film in Sheridon et al is applied directly to the balls in the manufacturing process. My film covers the outside of the entire solar concentrator (not the balls) for cleanliness protection during operation, and has nothing to do with the manufacturing process. It is much more difficult to protect other types of solar concentrators because they are highly curved, and covering them with removable layers of film would produce folding and creases that would adversely affect the optics -- since light rays would bend differently in different places and not in a predictable/dependable way.

6. d) **There are no sensors in Sheridon et al.** No variation of the word "sensor" occurs in this patent, and the patent has nothing to do with solar energy, a solar concentrator, or solar beam mis-stearing.

7. Quotation of 35 U.S.C. 103 (a): Obviousness

8. "Claims 2, 3, 8, 16 and 17 are rejected under 35 U.S.C. 103 (a) as being unpatentable over Sheridon et al...."

Supporting the solar receiver directly over the solar concentrator is a novel departure from solar concentrators of prior art. Since prior art solar concentrators cannot lay face-up directly on the ground, they do not have the option of having the solar receiver directly above them. The thrust of claims 2 and 16 is the word "above," and the word "rod" has been removed. So although this is a small part of the instant invention, this is indeed a novel aspect of it. Having the electrical wires inside a support rod may be an obvious thing to do once one can have the the solar receiver overhead, but neither was done in the past. However to avoid dispute over a minor point, and in the spirit of cooperation with Examiner Tra, applicant has cancelled claim 3.

Otherwise, with the exception of the rod and the fins, there is no obviouness in the instant invention as a whole, except in hindsight by a strained interpretation. Applicant has solved a different problem the reference. There has never been any suggestion or hint of a thin 2-dimensional like reflecting solar concentrator in any of the prior literature. It is not obvious to extrapolate from the distant unrelated field of "display technology" to the "solar technology field." In particular it is not obvious to go from rigid display apparatus with balls that do not have embedded mirrors to a reflecting solar concentrator that has micro-mirrors embedded in the balls. The instant invention utilizes a new principle of a reflecting solar concentration with "individually controlled mirrored balls" for the utilization of solar energy. Applicant has developed a totally new approach in this field, rather than following existing approaches.

The results achieved by the instant invention are new and superior to any existing solar concentrator. The problem solved by the instant invention of greatly reduced costs and ability to withstand the tribulations of nature such as wind gusts and earthquakes, was never before recognized since there is no literature that addesses these problems in the way that the instant invention does. The use of individually controlled mirrored balls is a big step forward that is totally unsuggested in the previous art. If the instant invention were indeed obvious, because of its great advantages, it would have surely been implemented or discussed prior to the instant invention. That those skilled in the art did not discuss or even hint at the instant invention is proof of its novelty and that the instant invention is not obvious. There is a long-standing serious need for lower-cost solar energy that was not solved until the instant invention solved it.

My point-by-point response here would be the same as my detailed response stated for point #6. Simply put,Sheridon et al is a display device; not a solar concentrator; has no mirrors; has no wand; their balls transmit rather than reflect;

they focus rather than track the light source since the light source is stationary; the light source is an artificial extended light source and not the sun; etc.

9. "Claims 6 and 20 are rejected under 35 U.S.C. 103 (a) as being unpatentable over Sheridon et al. (U.S. Pat. 5,815,306 A), as applied to claim 1 above, in view of O'Neill et al (U.S. Pat. 5,498,297 A)"

I have already commented as to why Sheridon et al. is not relevant art to cite against my patent application in items #6 and #7. I recognize the fins of O'Neill et al as relevant; and fin-related claims have been cancelled.

10. "Claim 13 would be allowable if rewritten ...."

I have amended the base claim 1 in a manner which should now make claim 13 allowable. Based upon my explanations in items #6 and #7, I think other sensor-related claims should now also be allowable.

11. "Claim 24 appears to be allowable if rewritten ...."

Thanks to Examiner Tra, I have ammended claim 24 in accord with his recommendation so that it should now be allowable.

III. Amendment of Claims

Applicant has amended claims as shown both in accord with Examiner Tra's findings and recommendations, and in keeping with his conscience as explained primarily in response to items #6 and #7 of the Office Action. Four claims, namely Claims 3, 6, 17, and 20 are thus cancelled. One new dependent claim, namely Claim 34, has been entered.

CLAIMS

1 (amended): A ~~receiver and~~ reflecting micro-optics solar concentrator which reflects the sun onto a solar energy receiver, comprising:

a) a solar concentrator with anisotropic rotatable specular reflection miniature mirrors embedded in balls ~~reflectors~~ disposed in a surrounding medium of an optically transmissive lubricating fluid disposed behind an optically transmissive surface;

b) electric coupling means for aligning ~~said~~ the anisotropic rotatable miniature specular reflection mirrors ~~reflectors~~;

c) means for tracking the sun with said mirrors ~~source of light~~; and

d) means for focusing said reflecting system unto said solar energy receiver.

2 (amended): The apparatus of claim 1, wherein said solar energy receiver is ~~supported by at least one rod~~ above said concentrator.

3. (cancelled): The apparatus of claim 1, wherein at least one rod acts as a conduit to carry electrical wires to and from said receiver.

4 (amended): The apparatus of claim 1, wherein said reflecting solar micro-optics concentrator is adjacent to and supported by the ground.

5 (amended): The apparatus of claim 1, wherein the said reflecting micro-optics solar concentrator is in modular form.

6 (cancelled): The apparatus of claim 1, wherein said receiver has fins for enhanced convective cooling.

7 (amended): The apparatus of claim 1, wherein the aligning means is at least one external electric field wand.

8 (amended): The apparatus of claim 1, wherein the aligning means is at least one external magnetic field wand.

9 (amended): The apparatus of claim 1, wherein said optically transmissive surface is covered by a plurality of ~~at least one~~ removable plastic films.

10 (original): The apparatus of claim 1, wherein a plurality of micro-optics solar concentrators are disposed in different angular orientations.

11 (amended): The apparatus of claim 1, wherein a plurality of micro-optics solar concentrators and solar energy receivers are each disposed in different angular orientations comprising at least one pair of concentrators and receivers in substantially parallel alignment.

12 (amended): The apparatus of claim 1, wherein a plurality of sensors are dispersed on the surface of said ~~micro-optics~~ solar energy receiver ~~concentrator~~ to sense solar beam mis-stearing.

13 (amended): The apparatus of claim 1, wherein a plurality of sensors dispersed on the surface of said ~~micro-optics~~ solar energy receiver ~~concentrator~~ to sense solar beam mis-stearing are connected to a circuit for fail-safe defocusing of the solar beam.

14 (amended): The apparatus of claim 1, wherein at least one pair of solar concentrators and solar receivers are placed under a transparent cover.

15 (amended): A method of concentrating and receiving ~~solar~~ energy from the sun provided by a solar energy receiver and solar concentrator with ~~anisotropic micro-optic~~ miniature mirror reflectors embedded in balls comprising the steps of:

a) aligning said ~~anisotropic micro-optic~~ miniature mirror reflectors by means of electric coupling;

b) tracking the sun with said mirrors ~~source of light~~; and

c) focusing the miniature mirrors ~~reflecting system~~ unto said solar energy receiver;

16 (amended): The method of claim 15 further comprising the step of supporting the solar energy receiver ~~by at least one rod~~ above said solar concentrator.

17. (cancelled): The method of claim 15 further comprising the step of utilizing at least one rod as a conduit to carry electrical wires to and from said receiver.

18 (amended): The method of claim 15 further comprising the step of placing ~~said~~ the solar micro-optics concentrator on the ground.

19 (amended): The method of claim 15 further comprising the step of constructing ~~said~~ the solar micro-optics concentrator in modular form.

20 (cancelled) The method of claim 15 further comprising the step of providing said receiver with fins for enhanced convective cooling.

21 (amended): The method of claim 15 further comprising the step of aligning said miniature mirror reflectors by means of an external electric field wand.

22 (amended): The method of claim 15 further comprising the step of aligning said miniature mirror reflectors by means of an external magnetic field wand.

23 (amended): The method of claim 15 further comprising the step of fiducializing the orientation of the miniature mirror reflectors in situ.

24 (amended): A method for improving the alignment ~~capability of~~ operability of rotatable miniature reflectors of a micro-optics solar concentrator system for concentrating reflected sunlight disposed in a surrounding medium of an optically transmissive lubricating fluid retained between upper and lower sheets, the lubricating fluid disposed behind an optically transmissive surface, the method comprising the steps of:

b) agitating the rotatable miniature reflectors relative to the surrounding media during heating.

25 (original): The method of claim 24 wherein the agitation is provided by vibration of the said micro-optics system.

26 (original): The method of claim 24 wherein the agitation is provided by rotation of the said rotatable miniature reflectors.

27(original): The method of claim 24, wherein the display is heated in the range of 35 to 90 degrees Centigrade.

28 (original): The method according to claim 24, wherein the rotatable miniature reflectors are balls.

29(original): The method according to claim 24, wherein the rotatable miniature reflectors are generally cylindrical.

30 (original): The method according to claim 24, wherein the rotatable miniature reflectors are electromagnetically anisotropic and wherein the agitating step includes alternating an electriomagnetic field and thereby rotating the anisotropic reflectors relative to the surrounding media.

31 (original): The method according to claim 24, wherein an alternating electric field is driven at one to three times the alignment field for the concentrator.

32 (original): The method according to claim 24, wherein an alternating magnetic field is driven at one to three times the alignment field for the concentrator..

33 (original): The method according to claim 24, wherein a manufacturing step includes drawing a vacuum between the said sheets so as to degas the medium therein.

34. (new) The method according to claim 15, wherein the orientation of the mirrored balls is carried out in situ by means of a fiducializing sensor.

CLAIMS

1 (amended): A reflecting micro-optics solar concentrator which reflects the sun onto a solar energy receiver, comprising:

a) a solar concentrator with anisotropic rotatable specular reflection miniature mirrors embedded in balls ~~reflectors~~ disposed in a surrounding medium of an optically transmissive lubricating fluid disposed behind an optically transmissive surface;

b) electric coupling means for aligning the anisotropic rotatable miniature specular reflection mirrors;

c) means for tracking the sun with said mirrors; and

d) means for focusing said reflecting system unto said solar energy receiver.

2 (amended): The apparatus of claim 1, wherein said solar energy receiver is supported above said concentrator.

3. (cancelled):

4 (amended): The apparatus of claim 1, wherein said reflecting solar micro-optics concentrator is adjacent to and supported by the ground.

5 (amended): The apparatus of claim 1, wherein the said reflecting micro-optics solar concentrator is in modular form.

6 (cancelled):

7 (amended): The apparatus of claim 1, wherein the aligning means is at least one external electric field wand.

8 (amended): The apparatus of claim 1, wherein the aligning means is at least one external magnetic field wand.

9 (amended): The apparatus of claim 1, wherein said optically transmissive surface is covered by a plurality of removable plastic films.

10 (original): The apparatus of claim 1, wherein a plurality of micro-optics solar concentrators are disposed in different angular orientations.

11 (amended): The apparatus of claim 1, wherein a plurality of micro-optics solar concentrators and solar energy receivers are each disposed in different angular orientations comprising at least one pair of concentrators and receivers in substantially parallel alignment.

12 (amended): The apparatus of claim 1, wherein a plurality of sensors are dispersed on the surface of said solar energy receiver to sense solar beam mis-stearing.

13 (amended): The apparatus of claim 1, wherein a plurality of sensors dispersed on the surface of said solar energy receiver to sense solar beam mis-stearing are connected to a circuit for fail-safe defocusing of the solar beam.

14 (amended): The apparatus of claim 1, wherein at least one pair of solar concentrators and solar receivers are placed under a transparent cover.

15 (amended): A method of concentrating and receiving energy from the sun provided by a solar energy receiver and solar concentrator with miniature mirror reflectors embedded in balls comprising the steps of:

a) aligning said miniature mirror reflectors by means of electric coupling;

b) tracking the sun with said mirrors; and

c) focusing the miniature mirrors ~~reflecting system~~ unto said solar energy receiver;

16 (amended): The method of claim 15 further comprising the step of supporting the solar energy receiver above said solar concentrator.

17. (cancelled):

18 (amended): The method of claim 15 further comprising the step of placing the solar micro-optics concentrator on the ground.

19 (amended): The method of claim 15 further comprising the step of constructing the solar micro-optics concentrator in modular form.

20 (cancelled)

21 (amended): The method of claim 15 further comprising the step of aligning said miniature mirror reflectors by means of an external electric field wand.

22 (amended): The method of claim 15 further comprising the step of aligning said miniature mirror reflectors by means of an external magnetic field wand.

23 (amended): The method of claim 15 further comprising the step of fiducializing the orientation of the miniature mirror reflectors in situ.

24 (amended): A method for improving the alignment operability of rotatable miniature reflectors of a micro-optics solar micro-optics solar concentrator system for concentrating reflected sunlight disposed in a surrounding medium of an optically transmissive lubricating fluid retained between upper and lower sheets, the lubricating fluid disposed behind an optically transmissive surface, the method comprising the steps of:

a) heating the solar concentrator for no more than four hours; and

b) agitating the rotatable miniature reflectors relative to the surrounding media during heating.

25 (original): The method of claim 24 wherein the agitation is provided by vibration of the said micro-optics system.

26 (original): The method of claim 24 wherein the agitation is provided by rotation of the said rotatable miniature reflectors.

27 (original): The method of claim 24, wherein the display is heated in the range of 35 to 90 degrees Centigrade.

28 (original): The method according to claim 24, wherein the rotatable miniature reflectors are balls.

29 (original): The method according to claim 24, wherein the rotatable miniature reflectors are generally cylindrical.

30 (original): The method according to claim 24, wherein the rotatable miniature reflectors are electromagnetically anisotropic and wherein the agitating step includes alternating an electriomagnetic field and thereby rotating the anisotropic reflectors relative to the surrounding media.

31 (original): The method according to claim 24, wherein an alternating electric field is driven at one to three times the alignment field for the concentrator.

32 (original): The method according to claim 24, wherein an alternating magnetic field is driven at one to three times the alignment field for the concentrator..

33 (original): The method according to claim 24, wherein a manufacturing step includes drawing a vacuum between the said sheets so as to degas the medium therein.

34 (new): The method according to claim 15, wherein the fiducial orientation of the mirrored balls is carried out in situ by means of a fiducializing sensor.

Respectfully submitted,

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